

## Claims

What is claimed is:

Claims 1-8 (canceled)

Claim 9 (new): A method of forming an inorganic macroporous material on a substrate exhibiting substantial periodicity, the method comprising the steps of:

providing a colloidal crystal template on a substrate comprising organic polymer particles;

introducing into the interstitial voids of the colloidal crystal template a noncolloidal inorganic precursor composition;

forming a hardened composite organic-inorganic structure; and

removing the colloidal crystal template from the hardened composite organic-inorganic structure to form an inorganic macroporous material on a substrate.

Claim 10 (new): The method of claim 9 wherein the colloidal crystal template is comprised of organic polymer particles.

Claim 11 (new): The method of claim 10 wherein the organic polymer particles are spheres.

Claim 12 (new): The method of claim 10 wherein the organic polymer particles comprises polystyrene, polymethylmethacrylate, or a fluorinated polymer.

Claim 13 (new): The method of claim 10 wherein the organic polymer particles comprises surfactant on the surface.

Claim 14 (new): The method of claim 13 wherein the surfactant comprises sodium dodecyl sulfate.

Claim 15 (new): The method of claim 13 wherein the surfactant fuses the organic polymer particles together.

Claim 16 (new): The method of claim 9 wherein the noncolloidal inorganic precursor composition comprises an inorganic precursor dissolved in a solvent.

Claim 17 (new): The method of claim 16 wherein the solvent comprises an alcohol.

Claim 18 (new): The method of claim 17 wherein the alcohol is anhydrous ethanol.

Claim 19 (new): The method of claim 16 wherein the noncolloidal inorganic precursor composition comprises an alkoxide.

Claim 20 (new): The method of claim 19 wherein the alkoxide comprises titanium(iv) isopropoxide, titanium(iv) ethoxide, titanium(iv) butoxide, titanium(iv) tert-butoxide, titanium(iv) methoxide, or titanium(iv) propoxide.

Claim 21 (new): The method of claim 9 wherein forming the hardened composite organic-inorganic structure comprises allowing the alkoxide in the interstitial voids of the colloidal crystal template to condense.

Claim 22 (new): The method of claim 9 wherein removing the colloidal crystal template from the hardened composite organic-inorganic structure comprises calcining the organic polymer particles.

Claim 23 (new): The method of claim 9 wherein the inorganic macroporous material comprises titania in nanocrystalline anatase form.

Claim 24 (new): The method of claim 9 wherein the step of introducing the noncolloidal inorganic precursor into the interstitial voids of the colloidal crystal template comprises subjecting the noncolloidal inorganic precursor and the colloidal crystal template on a substrate to a gravitational force.

Claim 25 (new): The method of 24 wherein the gravitational force is applied by centrifugation.

**Claim 26 (new):** The method of claim 9 wherein the inorganic macroporous material exhibits a photonic stopgap.

**Claim 27 (new):** The process of claim 9 wherein the substrate comprises glass, indium tin oxide coated glass, fluorine doped tin oxide coated glass, silicon wafer, quartz, or mica.

**Claim 28 (new):** The method of claim 9 wherein the inorganic macroporous material on a substrate exhibits a high quality three-dimensional periodicity.

**Claim 29 (new):** The method of claim 9 wherein the inorganic macroporous material exhibits a refractive index of at least 2.5.